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BRIEF COMMUNICATION

Charcoal Burning and Maternal Filicide-Suicide Trends in Taiwan: The Impact of Accessibility of Lethal Methods

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Charcoal burning has emerged as a novel suicide method in Taiwan and its impact on maternal filicide-suicide (MFS) remains unexplored. Using official national mortality data and reports of MFS cases from electronic newspaper archives, the authors aimed to examine whether the newly available charcoal burning was associated with an increase in MFS incidents during the period from 1999 to 2006. The trends for changes in age/gender/method-specific suicide rates and MFS incidence were analyzed and then correlated with each other. The results indicated that charcoal burning was the leading method of filicide in reported MFS incidents. The increase in MFS incidents paralleled that of charcoal burning-specific suicide rates in females aged 25–44 years, while suicide rates by other methods did not change significantly. Easy accessibility and perceived painlessness as conveyed by the media might account for the choices of charcoal burning for MFS. Restricting access to charcoal burning should therefore be prioritized for further prevention strategies. [*J Formos Med Assoc* 2008;107(10):811–815]

Key Words: charcoal, maternal behavior, murder, preventive measures, suicide

Maternal filicide-suicide (MFS) is a rare type of homicide-suicide.[1] In Taiwan, MFS is considered to be a form of *extended suicide* by the mothers who do not want to leave their children behind.[2] It is distinct from paternal filicide-suicide, which often occurs as part of a familicide. Tracing back the historical literature on MFS, an overwhelming majority of MFS cases (> 90%) used coal gas as the filicide method,[3] until the detoxification of domestic coal gas (by lowering the percentage of carbon monoxide) first took place in England and Wales in the late 1950s. The following years of gradual detoxification saw not only a drop in female suicide rates but also a decrease in MFS incidents.[3–5] It was speculated that the detoxification resulted in the reduction of both female simple suicide and MFS incidents.[3,6–9] This impressively illustrated how restricting the accessibility of a major lethal method may entail changes in female suicides in general and MFS specifically.

Despite the sharp distinction in culture, suicide by charcoal burning in Taiwan may have parallels with the coal gas situation. Suicides by charcoal burning and coal gas share important common characteristics. Burning charcoal in a sealed space produces a lethal level of carbon monoxide (CO) as does coal gas. Both methods are easily accessible: charcoal can be purchased in virtually every

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convenience store in Taiwan and coal gas was widely available to households in England. After making its first appearance in Hong Kong in 1998, suicide by charcoal burning not only caused a local epidemic but spread rapidly to nearby Asian countries, most likely through the influence of the media.[10,11] In Taiwan, the first case of suicide by charcoal burning was reported in 1999. By 2002, it had become the most commonly used suicide method for those aged 25–44 years. In 2006, charcoal burning was the second leading suicide method and accounted for an alarming 33.5% of total suicide deaths. Notably, this charcoal burning scenario is the reverse of what happened with coal gas, and provided the possibility of studying the impact of introduction of a new suicide method with easy accessibility. With reference to the previous events with coal gas, a significant increase in female suicide rates and MFS by charcoal burning, but not in those by other lethal methods, was expected, assuming that charcoal burning would be favored by the perpetrators of MFS.

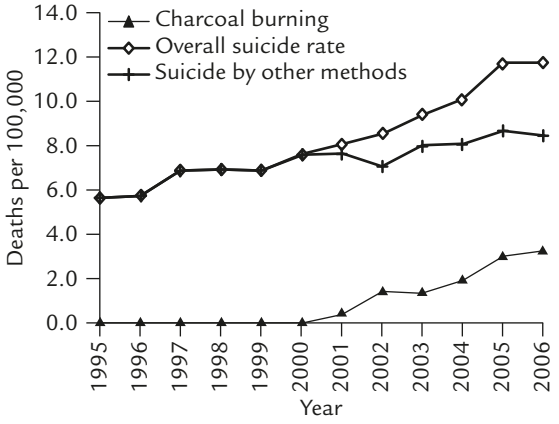

Figure 1. Charcoal burning-specific suicide rates: from 0.0 per 100,000 in 1999 to 3.2 per 100,000 in 2006; trend test: $t = 11.08$, $p < 0.0001$. Overall female suicide rates: from 6.9 per 100,000 in 1999 to 11.7 per 100,000 in 2006; trend test: $t = 13.69$, $p < 0.0001$. Suicide rates by all other methods: from 6.9 per 100,000 in 1999 to 8.5 per 100,000 in 2006; trend test: $t = 4.52$, $p = 0.004$. Spearman's rank-order correlation between overall suicide rates and those by charcoal burning: $r_s = 0.98$, $p < 0.0001$; between overall suicide rates and those by methods other than charcoal burning: $r_s = 0.90$, $p = 0.002$.

Methods

National mortality datasets of 33,751 suicide deaths for the years 1995 through 2006 provided by Taiwan's Department of Health were used to calculate age/gender/method-specific suicide rates. Suicide methods were classified according to the ICD-9 codes (charcoal burning: E952). Method-specific suicide rates for females aged 25–44 years were specifically examined as most MFS occurred during these child-bearing and rearing years. MFS was defined as an incident in which a mother killed her own children before committing suicide. The initial search for possible MFS cases was done in the electronic newspaper archives of six widely-circulated major newspapers in Taiwan. Paternal filicide-suicides and familicides were not included. Each MFS case was further traced to the original report to collect more information regarding demographic characteristics and lethal method adopted. The associations between the changes in MFS incidents and method-specific suicide rates for females aged 25–44 years were examined. The year 1999 was marked as the critical point because charcoal burning was introduced at that time. The MFS incidents before and after 1999 were then analyzed. Spearman's rank-order correlation coefficient (r_s) was calculated to detect a significant correlation and a p value < 0.05 indicated significance.

Results

After the introduction of charcoal burning in 1999, the increase in female suicide rates by charcoal burning paralleled the increase in overall female suicide rates from 1999 to 2006 ($r_s = 0.98$, $p < 0.0001$). Meanwhile, the increase in suicide rates by all other methods was less prominent (Figure 1). It was particularly noteworthy that among females aged 25–44 years, there was a significantly increasing trend of suicide by charcoal burning, whereas suicide by all other methods remained relatively unchanged during that period (Figure 2).

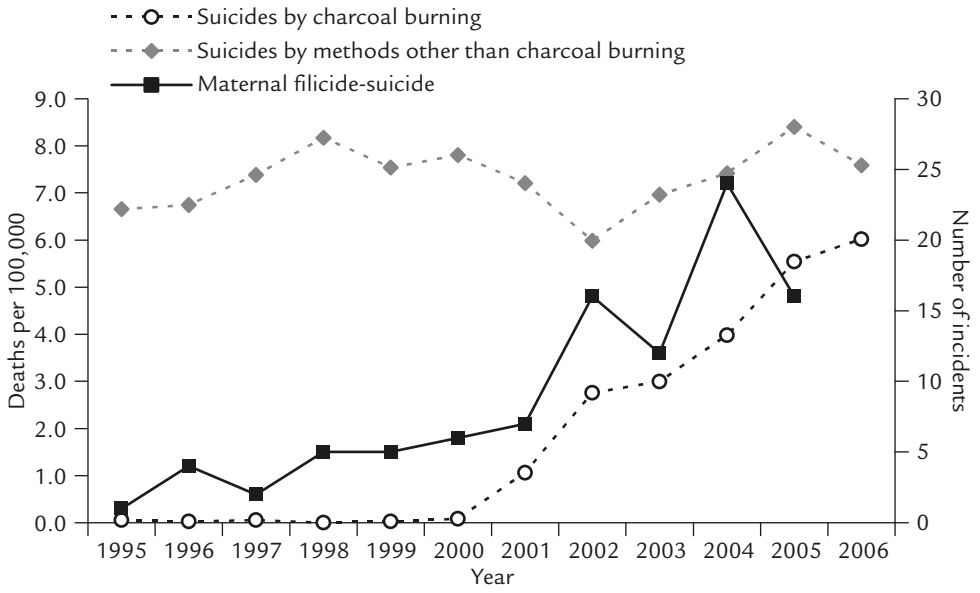

Figure 2. Suicide rates by charcoal burning: from 0.0 per 100,000 in 1999 to 6.0 in 2006 per 100,000; trend test: $t = 14.92$, $p < 0.0001$. Suicide rates by methods other than charcoal burning: from 7.5 per 100,000 in 1999 to 7.6 per 100,000 in 2006; trend test: $t = 0.51$, $p = 0.6298$. Incidents of maternal filicide-suicide (MFS): from 5 cases per year in 1999 to 16 cases per year in 2005; trend test: $t = 7.05$, $p < 0.0001$. Spearman's rank-order correlation between MFS and suicides by charcoal burning: $r_s = 0.98$, $p < 0.0001$; between MFS and suicides by methods other than charcoal burning: $r_s = 0.14$, $p = 0.7358$.

From 1992 to 2005, there were 101 MFS incidents in Taiwan: from one incident in 1992 to 16 incidents in 2005. The increase in MFS incidents after the introduction of charcoal burning was obvious. For the 7 years preceding 1999 (1992–1998), the total number of MFS incidents was 15; while for the 7 years following 1999 (1999–2005), the number of MFS incidents was 86. There was a marked increase in MFS incidents after 1999, which paralleled the trend in charcoal burning-specific suicide rates ($r_s = 0.98$, $p < 0.0001$), but not that of suicide rates by other methods ($r_s = 0.14$, $p = 0.7358$) (Figure 2). As for suicide methods used in MFS, charcoal burning was the leading one; taking only the years with an increase in the number of incidents of MFS (2002–2005), 35 out of the 68 incidents (51.5%) used charcoal burning as the MFS method.

Discussion

Two important findings emerged from the current study. First, after the introduction of charcoal burning, the number of MFS incidents increased and charcoal burning was the preferred method used in MFS. Second, the increase in MFS incidents paralleled that in charcoal burning-specific suicide rates for females aged 25–44 years; suicide rates by other lethal methods remained relatively unchanged during the same period. These findings demonstrated that the introduction of this novel lethal method was closely associated with the increase in female suicides and MFS incidents. It is difficult to make causal inferences about the relationship between the increase in MFS and charcoal burning suicide because the results could be influenced by the general increasing trend of suicide rates in Taiwan and the fact that more young people chose charcoal burning as the lethal method. In addition, potential reporting bias by the media might have contributed to the association between increased MFS and charcoal burning suicides. However, during the process of detoxification of coal gas in England and Wales (the percentage of CO was lowered from 13% in 1955 to 0% in 1974),[4] there was a decrease in MFS incidents from 12 to 5 cases per year during the

mid-1960s, then from 5 in the early 1970s to 3.6 in the 5-year period from 1988 through 1992.[6,9] Charcoal burning, as an example of the introduction rather than the withdrawal of a lethal method, can further testify to the postulation elicited by the coal gas story that altering the accessibility of a major lethal method may entail a marked change in both simple suicide and MFS rates.

Whether the increase in charcoal burning suicide merely represented the result of a substitute for other lethal methods is another important issue. Considering that there was no concomitant decrease in suicide rates by the older suicide methods, it was less likely that people simply shifted from older methods to charcoal burning. Because suicide rates by other methods did not increase as much as that by charcoal burning during that period, the increase in suicide by charcoal burning cannot be fully explained by a nonspecific increasing trend across all suicide methods. The same non-substitution phenomenon among suicide methods was also demonstrated by the coal gas example, where the increase in non-fatal suicide attempts after detoxification was far less than the decrease in suicide deaths; the overall number of both fatal and non-fatal suicide attempts also dropped along with the decrease in female suicide rates.[5] The evidence suggested that a substantial proportion of females simply gave up attempting suicide and were less prone to use lethal methods other than coal gas. It seems that substitution may only occur when methods share certain common characteristics with one another.

What are the common characteristics that prompted females aged 25–44 years and perpetrators of MFS to choose charcoal burning or coal gas? Both demographic and clinical features of those who committed suicide by charcoal burning resembled those by domestic gas poisoning.[12] The unrestricted availability and purported "painless" lethality by CO intoxication may be critical in choosing these lethal methods and are even more relevant in the case of MFS.[3] The unrestricted availability may be instrumental in MFS by lowering the barriers for implementing the act. The perceived painlessness might also be essential if it is true that the mothers preferred a filicide method perceived as painless.[3] Thus, when a major lethal method is not available and there are no alternatives with the same level of perceived painlessness and easy accessibility, some females probably would not have made a suicide attempt;[5] restricting access to this major lethal method may effectively block MFS.

A thorough understanding of charcoal burning as a lethal method has practical implications for preventive measures. Past studies indicated that people using charcoal burning had less expressed intent and diagnosed psychiatric disorders[12,13] and were at a higher risk of a successful suicide attempt.[14] It implied that they were relatively determined and were more difficult to detect in advance. Because people who choose charcoal burning as a method of suicide tended to use the same method on a further attempt, it seemed that they were less prone to use other suicide methods as a substitution when charcoal burning was unavailable.[14] In addition to efforts to identify groups at high risk for MFS, effective environmental/structural and legal interventions which include prohibiting sales of charcoal in convenience stores, education of charcoal merchants, setting up of CO detectors over certain areas, and unbiased information provided by the media concerning charcoal burning, should be prioritized.[10] In addition, psychosocial interventions, including supportive counseling and crisis intervention, are also critical for those at risk.

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